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## Barriers to guideline-concordant antibiotic use among inpatient physicians: A case vignette qualitative study

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### Abstract

**Background**—Greater adherence to antibiotic-prescribing guidelines may promote more judicious antibiotic use, which could benefit individual patients and society at large.

**Objective**—To assess physician knowledge and acceptance of antibiotic-prescribing guidelines through the use of case vignettes.

**Design**—We conducted semi-structured interviews with 30 inpatient physicians. Participants were asked to respond to three hypothetical case vignettes: 1) a skin and soft tissue infection (SSTI); 2) suspected hospital-acquired pneumonia (HAP); and 3) asymptomatic bacteriuria (ASB). All participants received feedback according to guidelines from the Infectious Diseases Society of America (IDSA) and were asked to discuss their level of comfort with following these guidelines.

**Setting**—Two acute-care teaching hospitals for adult patients

**Intervention**—None

**Measurements**—Data from transcribed interviews were analyzed using emergent thematic analysis.

**Results**—Participants were receptive to guidelines and believed they were useful. However, participants' responses to the case vignettes demonstrated that IDSA guideline-recommendations were not routinely followed for SSTI, HAP, and ASB. We identified three barriers to guideline-

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concordant care: 1) physicians' lack of awareness of specific guideline-recommendations; 2) tension between adhering to guidelines and the desire to individualize patient care; and 3) skepticism of certain guideline-recommendations.

**Conclusions**—Case vignettes may be a useful tool to assess physician knowledge and acceptance of antibiotic-prescribing guidelines. Using case vignettes, we identified three barriers to following IDSA guidelines. Efforts to improve guideline-concordant antibiotic-prescribing should focus on reducing such barriers at the local level.

## Keywords

guidelines; antibiotic use; qualitative; case vignettes

## Introduction

Clinical guidelines are prevalent in the field of medicine, but physicians do not consistently provide guideline-concordant care. Non-adherence with guidelines has been documented for a variety of clinical conditions, including chronic obstructive pulmonary disease,<sup>1,2</sup> pain management,<sup>3,4</sup> and major depressive disorder.<sup>5,6</sup>

Although several professional societies, including the Infectious Diseases Society of America (IDSA), have developed and disseminated guidelines on antibiotic use, adherence to antibiotic-prescribing guidelines is inconsistent. Several studies have documented inappropriate antibiotic prescribing for specific infections, including acute respiratory infections,<sup>7–9</sup> cellulitis,<sup>10,11</sup> and asymptomatic bacteriuria.<sup>12,13</sup>

Improving adherence to guidelines on antibiotic use could have several benefits. For certain infections, guideline-adherence has been shown to improve patient-outcomes and reduce resource utilization.<sup>10,14,15</sup> In general, guidelines promote more judicious use of antibiotics by clarifying when an antibiotic is indicated, which antibiotics to prescribe, and duration of antibiotic therapy. The more judicious use of antibiotics decreases a given patient's risk of developing an antibiotic-resistant infection and *Clostridium difficile*-associated diarrhea.<sup>16</sup> Judicious antibiotic use will also have societal benefits by slowing the spread of antibiotic-resistant bacteria.

As part of a local effort to improve antibiotic use, we decided to present physicians with hypothetical cases of common clinical scenarios to identify barriers to following antibiotic-prescribing guidelines. Previous investigators have used case vignettes to assess the quality of care physicians provide, including decisions about antibiotics.<sup>17–21</sup> We used case vignettes to assess physicians' familiarity with and acceptance of IDSA guidelines for 3 common infectious conditions: skin and soft tissue infections (SSTI), suspected hospital-acquired pneumonia (HAP), and asymptomatic bacteriuria (ASB). The findings from our project were intended to inform local interventions to improve antibiotic-prescribing.

## Methods

All interviews were conducted at two acute-care hospitals in Indianapolis, Indiana: Sidney and Lois Eskenazi Hospital and the Richard Roudebush Veterans Affairs Medical Center

(VAMC). Eskenazi Hospital is a 316-bed safety-net hospital for Marion County, Indiana. The Roudebush VAMC is a 209-bed tertiary-care facility that provides comprehensive medical care for 85,000 veterans. Both hospitals are academically affiliated with Indiana University's School of Medicine.

Both hospitals have empiric antibiotic-prescribing guidelines printed in their annual antibiograms. These guidelines, developed by each hospital's Pharmacy Department and the local Infectious Disease (ID) physicians, are distributed annually as a pocket booklet. During this study, an antibiotic stewardship program was active at hospital A but not hospital B. As part of this program at hospital A, an ID physician reviewed inpatients on antibiotics twice a week and, with the help of inpatient team pharmacists, provided feedback to the frontline prescribers.

For this study, inpatient physicians who prescribe antibiotics at either facility were invited to participate in a 30-minute confidential interview about their antibiotic-prescribing habits. All invitations were sent through electronic mail. The target enrollment was 30 physicians, which is consistent with prior literature on qualitative sampling.<sup>22</sup> Sampling was purposeful to recruit a heterogeneous group of participants from both hospital sites. Although such a sampling strategy precluded us from making conclusions about individual sub-groups, our intention was to obtain the broadest range of information and perspectives, thereby challenging our own preconceived understandings and biases.

The protocol and conduct of this study were reviewed and approved by the Indiana University Institutional Review Board. Participants read and signed an informed consent. No compensation was provided to physician participants.

A research assistant (A.C.) trained in qualitative interviewing conducted all interviews.<sup>23</sup> These interviews covered social norms, perceptions of risk, self-efficacy, knowledge and acceptance of guidelines. At the end of the interview, each participant was asked to respond to three case vignettes (Table 1), which had been developed by an ID physician (D.L.) based on both local and IDSA guidelines.<sup>24–26</sup> Participants decided whether to prescribe antibiotics and, if so, which antibiotic to use. After their response, the interviewer read aloud specific recommendations from IDSA guidelines and asked, "Would you feel comfortable applying this recommendation to your practice? Are there situations when you would not apply this recommendation?"

All interviews were audio-recorded, transcribed, and de-identified. All transcripts were reviewed by the study's research assistant (A.C.) for accuracy and completeness.

An ID physician (D.L.) reviewed each transcript to determine whether the participant's stated plan for each case vignette was in accordance with IDSA guidelines. Participants were evaluated on their decision to prescribe antibiotics and their choice of agents.

Transcripts were also analyzed using emergent thematic analysis.<sup>27–29</sup> First, two members of the research team (D.L., A.C.) reviewed all interview transcripts and discussed general impressions. Next, the analytic team re-read one-fifth of the transcripts, assigning codes to the data line-by-line. Codes were discussed among team members to determine the most

prominent themes. During this phase, codes were added, eliminated and combined while applying the codes to the remaining transcripts.<sup>30</sup> The analysts then performed focused coding: finalized codes from the first phase were applied to each transcript. The 2 analysts performed focused coding individually on each transcript in a consecutive fashion and met after every 10 transcripts to ensure consistency in their coding for the prior 10 transcripts. Analysts discussed any discrepancies to reach a consensus. Evidence was sought that may call observations and classifications into question.<sup>31</sup> Theoretical saturation was reached through the 30 interviews, so additional enrollment was deemed unnecessary. NVivo, version 9, software (QSR International, Cambridge, MA, USA) was used to facilitate all coding and analysis.

## Results

All participants were physicians who practiced inpatient medicine. Ten were women, and 20 were men. The median age of participants was 34 years (interquartile range, IQR 30–42). Twenty were attending, or staff, physicians and had spent a median of 10 years (IQR 3–15) in clinical practice. Of these attending physicians, 3 practiced pulmonary/critical care, 16 were hospitalists without subspecialty training, and 1 was a hospitalist with ID training. Seven attending physicians practiced exclusively at hospital A, 8 practiced exclusively at hospital B, and 5 practiced at both A and B. The remaining 10 participants were physicians-in-training, or residents, who practiced at both hospitals and were either in their third or fourth year of an Internal Medicine or Medicine/Pediatrics residency program.

All participants expressed general awareness of and familiarity with clinical guidelines. Most participants also found guidelines useful in their clinical practice. According to one resident, guidelines “give you a framework for what to do. If somebody questions what you are doing, it is easy to point to the guidelines” (24, resident). Others recognized that guidelines synthesized the latest evidence: “The guidelines tend to keep us up-to-date, because unless you’re focused on one system, it can be impossible to keep up with everything that is changing across the board” (28, attending). Some recognized the authoritative nature of guidelines: “Most of the guidelines are well-researched and are approved by a lot of people, so I don’t usually go against them” (6, attending). Another attending noted, “I’m not a specialist in the field, so I need to follow the guidelines” (8, attending).

Despite general agreement with guidelines in principle, our interviews identified three major barriers to following guidelines in practice: 1) lack of awareness of specific guideline-recommendations; 2) tension between adhering to guidelines and the desire to individualize patient care; and 3) skepticism of certain guideline-recommendations.

### Lack of awareness of specific guideline-recommendations

Although participants stated that they agreed with guidelines in general, many had difficulty describing specific guideline-recommendations. Two residents acknowledged that their attending physicians did not seem familiar with guidelines. In response to hearing a guideline-recommendation on HAP, one resident stated, “I’m learning from them [the guidelines] as we speak.” In addition, one attending admitted that she was not familiar with

the guidelines: “Now that you’re asking about [prescribing] outside of the clinical guidelines, I am sitting here thinking, ‘I can’t think of any [guidelines]’...In fact, I will say that I am probably not aware of all of the clinical guidelines or changes in them in recent years” (28, attending).

Knowledge deficits were evident in participants’ responses to the case vignettes (Table 2, quotations 1–2). For the case of SSTI, 3 staff physicians wanted to prescribe antibiotics with activity against gram-negative bacteria, which is not in accordance with IDSA guidelines. In the case of suspected HAP, the majority of physicians were unaware that, according to guidelines, negative cultures from the lower-respiratory tract and clinical improvement should prompt consideration of stopping antibiotics. Finally, for the case of ASB, 6 participants (3 attendings, 3 residents) stated a desire to treat with antibiotics, which was not in accordance with IDSA guidelines.

### **Tension between adhering to guidelines and individualizing patient care**

Although participants agreed with guidelines in principle, they had difficulty applying specific guideline recommendations to an individual patient’s care. Many participants acknowledged modifying these recommendations to better suit the needs of a specific patient:

So guidelines are guidelines, but at the end of the day, it still comes down to individualizing patient care, and so sometimes those guidelines do not cover all the bases, and you still need to do what you think is best for the patient (10, attending).

The guidelines are not examining the patient, and I am examining the patient. So I will do what the guidelines say unless I feel that that patient needs more care (11, resident).

Participants valued their own clinical observations over guideline-recommended care (Table 2, quotations 3–6). In the case vignette of suspected HAP, the observation that the patient’s clinical status improved while receiving antibiotics took precedence over the negative culture-results or the guideline-recommendations. Guideline-recommendations and the primary literature were in conflict with the “objective evidence” the physicians collected at the bedside: “Fine, the study says something, but your objective evidence about what happened [is different]. He had this fever; he had these radiologic changes that are suggestive of pneumonia; you start antibiotics; he gets better, so that clinical scenario suggests an infection that is getting better” (15, resident).

Participants readily acknowledged the limitations of clinical guidelines. They described unique clinical situations that guidelines did not address and specific patient populations that have not been well-studied. According to many participants, these unique situations demanded independent decision-making: “[I would treat outside of guidelines] when we are treating severe sepsis in somebody with advanced liver disease. Most of the clinical research programs....exclude patients with advanced liver disease if they have risks for certain types of infections that are unusual” (16, attending). Two attending physicians believed that guidelines on pneumonia could not be applied to patients who recently had lobectomies

(Table 2, quotation 4). One attending physician argued that guidelines on ASB could not be applied to sedated patients in the ICU with an indwelling urethral catheter:

If it's a patient who is intubated and sick, they can't complain [about urinary symptoms], so the asymptomatic part of that goes out the window. For critically ill patients on ventilators that have bacteriuria, particularly if it's an ESBL [extended-spectrum beta-lactamase], which is a bad bacteria, not wanting the patient to get sicker and not knowing if they are having symptoms of pain or both, I might consider treating in that kind of situation, even though they are afebrile and no [elevated] white count (20, attending).

### Skepticism of guideline recommendations

A third barrier to guideline adherence was physicians' skepticism of what the guidelines recommend in certain cases. This skepticism stemmed, in part, from guidelines promoting a standardized, "one-size fits all" approach even in situations when participants were more comfortable using their own judgment:

To me, the guidelines are adding a little bit more of a stress, because the guidelines are good for the more obvious things; they're more black and white, this than that. But clinical medicine is never like that. There is always something that makes it really gray, and some of it has to do with things that you're seeing because you're there with the patient that doesn't quite fit (25, attending).

One resident acknowledged difficulty with guidelines that recommended against "doing something"; he felt more comfortable offering treatment as opposed to withholding it:

Overall, guidelines are easy to follow when they have what to do as opposed to what not to do....We are trained to do something and fix something, so to not do anything is probably the hardest guideline to follow (11, resident).

This skepticism was evident in the participants' responses to the case vignettes (Table 2). One attending found the recommendation not to treat ASB "tough to swallow" (19, attending). A resident also expressed concern with not prescribing treatment for the positive urine culture: "It is just scary that he is growing such a bad bug and with a bad microbe, I would be worried about it progressing" (11, resident). For the case of suspected HAP, one attending described the recommendation to consider stopping antibiotics "nerve-wracking" (28, attending). Another acknowledged she would have difficulty stopping all antibiotics after only 3-days of therapy: "It would make me a little nervous following them [the guidelines]. I think I would finish the course because he had a fever, and we started him on antibiotics and he got better....I still feel clinically that he could have had pneumonia" (25, attending).

Both residents and attending physicians expressed skepticism about the evidence behind some guideline-recommendations or admitted that they did not agree with the recommendations (Table 2, quotations 7–11). For example, when presented with the guideline-recommendation to stop antibiotics for HAP if the patient has clinically improved and a lower-respiratory tract culture was negative, a majority of participants stated that they were not comfortable following it.

## Discussion

In this study, we used case vignettes to identify barriers to following IDSA guidelines. Case vignettes require few resources and provide a common starting point for assessing physician decision-making. Prior studies have used case vignettes to measure the quality of physicians' practice, including antibiotic-prescribing.<sup>17–21</sup> Case vignettes have been used to assess antibiotic-prescribing in the neonatal intensive care unit and medical students' knowledge of upper respiratory tract infections.<sup>21,32</sup> In one study, physicians who scored poorly on a series of case vignettes more frequently prescribed antibiotics inappropriately in actual practice.<sup>17</sup>

Using case vignettes, we identified three barriers to following IDSA guidelines on SSTI, HAP, and ASB: 1) lack of awareness of specific guideline-recommendations; 2) tension between adhering to guidelines and the desire to individualize patient care; and 3) skepticism of certain guideline-recommendations. These barriers were distributed unevenly across participants, highlighting the heterogeneity that exists even within a subgroup of hospital medicine physicians.

We identified lack of familiarity with guideline-recommendations as a barrier in our sample of physicians. Interestingly, participants initially expressed agreement with guidelines, but when presented with case vignettes and asked for their own treatment recommendations, it became clear that their familiarity with guidelines was superficial. The disconnect between self-reported practice and actual adherence has also been described in a separate study on healthcare-associated pneumonia.<sup>33</sup> In all likelihood, participants genuinely believed that they were practicing guideline-concordant care, but without a formal process for audit and feedback, their lack of adherence had never been raised as an issue.

A second barrier to guideline-concordant care was the tension between individualizing patient care and adhering to standardized recommendations. On one hand, this tension is unavoidable and is inherent in the practice of medicine. However, participants' responses to our case vignettes suggested that they find their patients too different to fit into any standardized guideline. This tension was also discussed by Charani *et al.*, who interviewed 39 healthcare professionals at 4 hospitals in the United Kingdom. These investigators found that physicians routinely consider their patients to be “outside” the recommendations of local evidence-based policies.<sup>34</sup> Instead of referring to guidelines, physicians rely on their knowledge and clinical experience to guide their antibiotic-prescribing.

The final barrier to guideline adherence that we identified was providers' skepticism of what the guidelines were recommending. While physician discomfort with certain guideline-recommendations may be alleviated by reviewing the literature informing the recommendation, education alone is often insufficient to change antibiotic-prescribing practices.<sup>35</sup> Furthermore, part of this skepticism may reflect the lack of data from randomized controlled trials to support every guideline-recommendation. For example, most guideline-recommendations are based on low-quality evidence.<sup>36</sup> The guideline-recommendations presented in this study were based on moderate to high-quality evidence.<sup>24–26</sup>



To our knowledge, this study is one of the few to describe barriers to guideline-concordant antibiotic use among inpatient medicine physicians in the United States. The barriers discussed above have also been described by investigators in Europe who studied antibiotic use among inpatient physicians.<sup>34,37,38</sup> These commonalities highlight the shared challenges faced by local initiatives to improve antibiotic prescribing.

Our findings suggest that the 2 hospitals we studied need more active interventions to improve antibiotic-prescribing. One attractive idea is involving hospitalist physicians in future improvement efforts. Hospitalists are well-positioned for this role: they care for a large proportion of hospital patients, they frequently prescribe antibiotics, and—as a profession—they are committed to the efficient use of healthcare resources. Hospitalists could assist in the dissemination of local guidelines, the implementation of reliable processes to prompt antibiotic de-escalation, and the development of local standards for documenting the indication for antibiotics and the planned duration of therapy.<sup>39</sup>

One limitation of this study is that we did not validate whether a physician's self-reported response to the case vignettes correlated with his or her actual practice. Interviews were conducted by a non-physician and kept confidential, but participants may nonetheless have been inclined to give socially desirable responses. However, this is less likely since participants readily admitted to not knowing and often not following guidelines. In addition, our case vignettes presented simplistic, hypothetical situations and were therefore less able to account for all determinants of antibiotic-prescribing decisions. Prior research has shown that antibiotic-prescribing decisions are influenced by a multitude of factors, including social norms and the physician's underlying beliefs and emotions.<sup>34,40</sup> Antibiotic-prescribing decisions can also be influenced by audit-and-feedback processes.<sup>35</sup> Thus, we acknowledge that our findings may have been different if this study was conducted exclusively at hospitals without an antimicrobial stewardship program.

In conclusion, case vignettes may be a useful tool to assess physician knowledge and acceptance of antibiotic-prescribing guidelines on a local level. This study used case vignettes to identify key barriers to guideline-concordant antibiotic use. Developing local interventions to target each of these barriers will be the next step in improving antibiotic-prescribing.

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**Table 1**

Case vignettes presented to 30 inpatient physician participants

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- 1 A 40 year old man with poorly controlled Type 2 diabetes develops pain and redness over the dorsum of his foot. He presents to the emergency room the day after these symptoms started. He denies any recent penetrating injuries to his foot, including no animal bites, and denies any water exposure. At the time of presentation, his temperature is 101.1°F, pulse 89, his blood pressure is 124/76, and his respiratory rate is 16. Tender edema, warmth, and erythema extend up to the pretibial area of his right lower leg. Fissures are present between his toes, but he has no foot ulcers. There are no blisters or purulence. When you palpate, you don't feel any crepitus or fluctuance. He has a strong pulse at both dorsal pedis and posterior tibial arteries. Labs reveal a normal white blood cell count. What is your diagnosis? What antibiotics would you start?
  - 2 A 72 year old man is admitted for a lobectomy. About 6 days after his operation, while still on mechanical ventilation, he develops findings suggestive of pneumonia, based on a new right lower lobe infiltrate on chest x ray, increased secretions and fever (101.1°F). A blood sample and an endotracheal aspirate are sent for culture. He is empirically started on vancomycin and piperacillin/tazobactam. After 3 days of empiric antibiotics, he has had no additional fevers and has been extubated to room air. His WBC count has normalized. Blood cultures show no growth. The respiratory sample shows >25 PMNs and <10 epithelial cells; no organisms are seen on gram stain and there is no growth on culture. Would you make any changes to his antibiotic regimen at this time? If so, how would you justify the change?
  - 3 A 72 year old man presented with a severe *Clostridium difficile* infection, which resulted in both respiratory and acute renal failure. He gradually improved with supportive care, oral vancomycin, and IV metronidazole. After over a month of being hospitalized in the ICU, his Foley was removed. He was subsequently found to have urinary retention, so he was straight catheterized. The urine obtained from the straight catheterization was cloudy. A urinalysis showed 53 WBCs, positive nitrite, and many bacteria. Urine culture grew >100K ESBL producing *E.coli* (ESBL=extended spectrum beta lactamase). He wasn't having fevers. He had no leukocytosis and no signs or symptoms attributable to a UTI. What is your diagnosis? What antibiotics would you start?
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Themes and illustrative quotations identified from semi-structured interviews of 30 inpatient physicians

Table 2

Category	Case vignette	Illustrative quotation
1. Lack of awareness of specific guideline-recommendations	SSTI	1. "[Treating for] methicillin susceptible [ <i>S. aureus</i> ] without MRSA? Oh, oh, wow...[and] not doing any gram negative coverage? I guess I am most comfortable with that, but if that's the guideline [recommendation], yes, I will probably start following it" (8, attending).
	ASB	2. "I still think that he has a UTI [urinary tract infection], even though he doesn't necessarily have symptoms, because he was catheterized for so long. I also know after you reach a certain age, we generally treat you even though you don't necessarily have symptoms just because of all the risks associated with having bacteria in your urine" (29, resident).
2. Tension between adhering to guidelines and individualizing patient care	SSTI	3. "If he had a known history of MRSA, if he had something else like...a temporary dialysis line...or prosthetic joint or something else that if he were to get bacteremic with MRSA, it would cause him more operations and significant morbidity...[In that case], I might add vancomycin to his regimen from the beginning" (12, resident).
	HAP	4. "He has only one lung because he had part of his lung taken out. So, anyway, part of a lung taken out, and he's got a new infiltrate on his x-ray, and he's got all the risk factors for pneumonia, so I would say generally I would leave him on antibiotics, but cut down" (5, attending).
	ASB	5. "I would be concerned, especially since the patient was febrile. He did have a new infiltrate, and he seemed to have gotten better on antibiotics. I would definitely take it [the guideline-recommendation] into consideration, but I would probably go ahead and give a course of oral antibiotics" (6, attending).
	ASB	6. "I would say this is a UTI. I'm sure the guidelines are going to say 'no,' but since he was having retention and it wasn't a urine [culture] obtained from him having a Foley, I have less comfort calling it colonization. I would say that it is probably an infection. You don't see a lot of fevers in just a bladder infection" (25, attending).
3. Skepticism of guideline recommendations	SSTI	7. "My big concern is methicillin-resistant <i>Staph aureus</i> (MRSA)...I think personally I have some concern about not covering for MRSA" (17, attending).
	HAP	8. "Those are the guidelines, so I mean it is agreeable if there are studies that back it up. It is not something I feel that great about, but I could trial them off antibiotics and see how they do" (14, resident).
	ASB	9. "I guess I would have to look more at the studies that led to the recommendations...I don't know that I would stop antibiotics completely because of how sick he was" (29, resident).
	ASB	10. "They [the guidelines] are tough to swallow, but we follow them because that is what the evidence shows. A lot of people would be very, very tempted to treat this" (19, attending).
	ASB	11. "A guy has a catheter in for a month and has a ton of white cells in his urine and is growing something that is clearly pathogenic: he needs treatment. I do not care what the guidelines say" (7, attending).